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THE INFLUENCE OF BLENDED LEARNING, LEARNING STYLES AGAINST UNDERSTANDING MATH CONCEPTS

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Abstract

Implementation of math courses in economics , aims to strengthen the foundation of a student as a basis for other courses such as microeconomics, macroeconomics, research methods, statistics, and others. The results of observations conducted research shows there are many students who are weak in the ability of understanding the concept even though the student has to take math courses . To overcome these problems required the efforts to improve the quality of learning , one of which is to apply appropriate instructional strategies to student characteristics such as learning style . Learning strategies that can bridge the above problems one of which is a blended learning instructional strategies . This study aimed to examine (1) the influence of blended learning instructional strategies on the ability of understanding the concept of matter , especially a linear function , (2) differences in student learning outcomes based on learning styles , and (3) the effect of the interaction between learning strategies and learning styles blended learning to the understanding of the concept linear function of the material .

The conclusion of this study were (1) no significant difference in the ability of understanding mathematical concepts between classes with individual learning strategies blended learning and classroom learning with blended learning strategy group, (2) there are significant differences in the ability of understanding mathematical concepts among students who have learning styles of students who have FI and FD learning styles, and (3) there is an interaction between individual learning strategies blended learning and group learning strategies, learning styles on the ability of understanding mathematical concepts.

Key words: blended learning, learning styles, and understanding of concepts.

1. Introduction

Face to face teaching strategy is a strategy that is most often done by each teacher both at elementary through college. This strategy has the advantage of easier interaction between students and teachers and monitoring of teachers to students is easier to do, apart from the advantages mentioned above, this strategy also has shortcomings treat them the same learning ability of students and the limited opportunity to explore the ability of self-study results to be unsatisfactory. The problem of this study is the low learning outcomes for students in particular courses of Mathematics.

The problem of this strategy will be addressed among others by leveraging technological developments. The using of other media whiteboard, marker, and the book seems to have started to use the instructor to learn the strategies to overcome obstacles face to face. One of the media being used is Internet, by this media instructor gives the subject matter online. Online teaching strategy has the advantage that is students can study wherever and whenever they like, in addition to the freshmen more liberal in deepening material without hanging off the hook and tied to the presence of an instructor. In addition to having the advantages of online strategy also appears to have a lack of scale of the lateral interaction between students and instructors so that students do not have a place to ask questions when there is something that is not understood, the quality of the low bandwidth, as well as students who have not been accustomed to self-learning, to the other strategies needed online strategy. The need to develop other ways that students can learn on your own, they still have the supervision of an instructor. One alternative is combining e -learning with conventional teaching. Teaching strategies at this time looked exactly is the strategy that combines face-to- face instruction with online learning. This strategy is known by the term *blended learning* teaching strategies.

Blended learning teaching strategies implemented with the aim to complement each teaching strategy, because both the teaching strategies of course has advantages and disadvantages. The advantage of face to face teaching is that there is a strong interaction between teachers and students, while the drawback is that not all students have the speed and the same learning style. While online learning has the advantages of learning resources provided are not restricted, while the disadvantage is the lack of interaction between teachers and students.

2. Problem Formulation

Based on the description of the background of the above problems, the formulations of the problems are,

1. Are there any differences in the ability of understanding the concept of a linear function ini blended learning given individualy vs. group?
2. Are there differences in the ability of understanding mathematical concepts among students who have learning styles field independent (FI) and field dependent (FD)?
3. Is there an interaction between blended learning teaching strategies, learning styles againts the ability of understanding mathematical concepts?

3. Literature

3.1. Learning Styles

Within the Suradi (2008) explains that the characteristics of the pupil / student who has type FD and FI are (1) the student / students who have the cognitive style of FD type tend to perceive a pattern as a whole. It is difficult for him to focus on one aspect of a situation or analyze a pattern into a manifold, (2) student / students who have type FI cognitive styles tend to perceive separate parts of a pattern according to its components. Suradi explained that each cognitive style contains advantages and disadvantages. Students who have the cognitive style of FD stronger remembering social information such as conversations, while students who have FI cognitive styles more easily parse complex things and more easily solve problems.

3.2. The Ability Understanding Math Concepts

Good education is a successful effort to bring students to the objectives to be achieved is

that the material submitted by the student fully understood, it is in harmony with the statement of Hudoyo (2003) who explains that the purpose of teaching is that knowledge can be understood by the student.

Seeing that understanding is one of the main prerequisites for a person to learn more , then the acquisition of Bloom's Taxonomy of learning is divided into three domains , namely cognitive , affective , and psychomotor . Cognitive domain includes (1) knowledge , (2) comprehension , (3) application , (4) analysis , (5) synthesis , and (6) evaluation . Affective domain includes (1) the introduction , (2) giving the response , (3) respect for the value , (4) organization , (5) practice . While the psychomotor domain includes (1) imitation, (2) manipulation , (3) the accuracy of the movement , (4) articulation , and (5) naturalization . While Merrill (2008) divides the cognitive learning outcomes are divided into two dimensions , namely (1) the level of recall behavior , use , and finding , and (2) the type of material that includes facts , concepts , procedures , and principles . Based on the above it can be concluded that the learning gains can be achieved in the form of (1) considering the facts , concepts , procedures , and principles , (2) using the concepts , procedures , or principles , and (3) find the concepts , procedures , and principles .

According to Sutton & Hayso in Wanhar (2008) in terms of the mathematical concept of function is divided into three categories (1) clasificational concept is a concept that allows us to classify objects, for example, the concept of triangles, rectangles, cubes, blocks, sets, and so on. In klasifikasional concepts are concepts that demonstrate quantitative variables such as length, area, volume, and weight, (2) the concept of correlation is a concept that allows us to connect the concept of one another, and (3) theoretical concept.

3.3. *Blended Learning Teaching Strategy*

Blended learning teaching strategy is basically a combination of teaching is done in face-to-face and virtually.

According to Semler (2010) is

> *"Blended learning combines the best aspects of online learning, structured face-to-face activities, and real world practice. Online learning systems, classroom training, and on-the-job experience have major drawbacks by themselves. The blended learning approach uses the strengths of each to counter the others' weaknesses."*

Driscoll's (2012) devided into four definitions as follow,

1. *Combining or mixing web-based technology to accomplish an educational goal.*
2. *Combining pedagogical approaches (e.g. constructivism, behaviorism, cognitivism) to produce an optimal learning outcome with or without learningal technology.*
3. *Combining any form of learningal technology with face to face instrucktor-led training.*
4. *Combining learningal technology with actual job tasks.*

4. Research Methods

4.1. Types of Research

The research was designed using a type of quasi-experimental research, Suhardjono (2010) explained that the experiment the research has three principal characteristics, namely the presence of (1) the independent variables are manipulated, (2) control or the control of all other

variables, except the manipulated independent variable, and (3) observation and measurement of the dependent variable as a result of the manipulation of independent variables. This study requires two groups of subjects were selected at random, one experimental group and one control group.

4.2. Research Variables

1. Independent Variable

Independent variable of this research is how to *implement blended* learning instructional strategies provided by induvidually and groups. This variable is manipulated in the form of a website.

2. Moderator Variable

Moderator variables in this research are the characteristics of students in the form of learning styles that are divided into two parts, namely the FI and FD.

3. Dependent Variable

The dependent variable in this research is an understanding of the concept of a linear function.

4.3. Population and Sample

The population of this study were students STIE Ekuitas 1st semester of the academic year 2013/2014 as many as 86 people.

4.4. Data Analysis Methods

Before performing data analysis, firstly to test the normality of data and homogeneity of variance between groups. After assuming parametric tested, the next step is to perform data analysis using SPSS 17.0 for Windows. Data analysis techniques in this study using statistical methods MANOVA two lanes. Test the null hypothesis (Ho) was performed at a significance level of 5% or $\alpha = 0.05$. The final step of the data analysis is to interpret the results in order to test the hypothesis of the research and make conclusions.

5. Research Results

5.1. Description of Learning Styles

Based on the scores obtained in tests of learning style obtained the following results. For blended learning strategies students with individual learning styles and FI of 15 students who have learning styles FD by 26 people. The result of the grouping can be seen in table 1 below,

Table 1. Spreading The number of Samples Based on Learning Styles

Learning Strategy	**Learning Styles**		Amount
	FI	FD	
Blended Learning Individual	15	26	41
Blended Learning Gropu	22	23	45
Total	37	49	86

5.2. Description of Understanding Concepts

Pre-test and post-test testing was done in order to obtain data, which further data will be analyzed to test the hypothesis.

Table 2. Pre-test Scores of Understanding the concept of data based on Learning Strategies

	N	Mean	Std. Deviation
BL-INDIVIDU	41	15.3	2.73
BL-KELOMPOK	45	11.8	3.64
Valid N (listwise)	41		

From Table 2 note that the average pre-test results by understanding the concept of a linear function of learning strategies have fairly large difference is 3.5.

Table 3. Average Pre-test Score Data of Understanding Concept based Learning Style

	Learning Styles	N	Mean	Std. Deviation
Score	FI	37	15.5	3.21
	FD	49	11.6	3.09

Table 3 shows that the average score based on the style of learning is divided into two, namely the average scores for the learning styles of FI was 15.5 and the average score for the learning style of FD of 11.6. The difference between the two scores is 3.9.

Table 4. Post-test Score Data of Comprehension Concept Based on Learning Strategies

	N	Mean	Std. Deviation
BL-INDIVIDUAL	41	30.4	5.86
BL-GROUP	45	32.2	4.09
Valid N (listwise)	41		

After the experiments were blended learning instructional strategies of individual and group blended learning, it can be seen that the average score of understanding the concept of a linear function of pretest to posttest increase in any learning strategy. The average post-test results of understanding the concept of a linear function of blended learning based on individual learning strategies of 30.4, while the strategy is based on learning blended learning groups at 32.2. The difference between the two learning strategies that is equal to 1.8.

Table 5. Post-test Scores Data of Comprehension Concept Based on Learning Style

	EARLY KNOWLEDGE	N	Mean	Std. Deviation
Score	FI	37	34.7	2.29
	FD	49	27.9	4.89

Having conducted an experiment based on learning styles, it can be seen that the average score of understanding the concept of a linear function of pre-test to post-test increase. The average post-test results for the understanding of the concept of a linear function of the learning styles of students who have previously FI of 15.5 increased to 34.7. While students who have a learning style that the original FD increased by 11.6 to 27.9. The difference between

the posttest scores of students learning style FI with student learning style FD is equal to 6.8.

6. Pre-test Scores Analysis

The analysis is divided into two parts, namely the analysis of pretest scores based learning strategies and analysis of pre-test scores based on learning styles. Analysis of pretest scores based learning strategies are divided into two dimensions of individual and group blended learning strategies. The division into two dimensions also been conducted on the pre-test scores analysis based on learning style, ie FD and FI learning styles. Under these conditions, the analysis is done by using *Levene's test*.

6.1. Pre-test Scores Analysis Based on Learning Strategy

The results of different test average score of understanding the concept of a linear function based learning strategies can be seen in table 6.

Table 6. Average Test Scores of Understanding Concept Based on Learning Strategies

		Levene's Test for Equality of Variances	
		F	Sig.
UNDERSTANDING CONSEPT	Equal variances assumed	4.501	.027
	Equal variances not assumed		

Analysis of variance of understanding the concept of a linear function with Levene's Test (sig = 0.027) which means that the significance of less than 0.05. This means that H_0 is rejected, meaning that there is a significant difference between the understanding of the concept of linear function classes with individual blended learning strategies and classroom learning with blended learning strategy in group.

6.2. Pre-test Scores Analysis based on learning styles

The results of different test average score of understanding the concept of a linear function based on the learning styles can be seen in Table 7.

Table 7. Average Test Scores of Understanding Concept Based on learning styles

		Levene's Test for Equality of Variances	
		F	Sig.
UNDERSTANDING CONSEPT	Equal variances assumed	13.429	.000
	Equal variances not assumed		

Analysis of variance using Levene's test showed sig = 0.000, which means a smaller significance level of 0.05. This shows that H_0 is rejected, which means there is a significant difference between the understanding of the concept of a linear function of students who have learning styles that students have the FI and FD learning styles.

6.3. Hypothesis Testing

In accordance with the purpose of testing the hypothesis, the data was analyzed by using posttest scores. Both groups act scores as the dependent variable, while the independent variable

is the learning strategy that consists of individual and group learning strategies blended learning. The moderator variable is a style of learning that consists of learning styles and learning styles FD FI.

Test assumptions including normality test and homogeneity of variance between groups were performed prior to analysis using Manova. Posttest scores normality test performed on the scores of understanding the concept and application of linear functions procedure using the *Kolmogorov-Smirnov* and the *Shapiro-Wilk* test.

6.4. Normality and homogeneity test Comprehension Concept Based on Learning Strategy

Based on the normality test through the *Kolmogorov-Smirnov* and *Shapiro-Wilk* obtained calculation results are presented in Table 8. below,

Table 8. Normality Test Scores of Understanding Concept Based on Learning Strategies

Normality Tests							
	LEARNING STRATEGIES	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	Df	Sig.
UNDERSTANDING CONSEPT	BL-INDIVIDUAL	.111	43	.200*	.940	43	.026
	BL-GROUP	.125	44	.081	.953	44	.071

Kolmogorov-Smirnov test for understanding concept of linear functions through individual and group blended learning strategies of each has a significance value of 0.200 and 0.081. The *Shapiro-Wilk* test through the level of significance for the understanding of the concept of linear functions through individual and groups blended learning instructional strategy of each has a significance value of 0.026 and 0.071. Based on the test results a significance level greater than 0.05, it can be said that the data balanced linear function of the ability of understanding the concept of learning strategies based on normal distribution.

Table 9. The homogeneity of variance test scores of Comprehension Concept Based on Learning Strategies

		Levene Statistic	Sig.
UNDERSTANDING CONCEPT	Based on Mean	4.501	.087
	Based on Median	3.555	.063
	Based on Median and with adjusted df	3.555	.063
	Based on trimmed mean	4.421	.038

From the results of the calculations in Table 9 above shows that the mean of understanding the concept of a linear function of the numbers of significance is 4.501 and 0.087 which means greater than 0.05. Figures significance greater than 0.05 shall also apply if the measurement is taken through the median, where the numbers of significance is 0.063. The conclusion from the above calculation is the data derived from populations having the same variance (homogeneous).

6.5. Normality and Homogeneity Test Results of Understanding Concept Based on Learning Styles

Based on the normality test through the Kolmogorov-Smirnov and Shapiro-Wilk obtained calculation results are presented in Table 10 below,

Table 10. Normality Test scores of Understanding Concept Based on Learning Styles

Normality Tests							
	LEARNING STYLES	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
UNDERSTANDING CONCEPT	FI	.166	44	.094	.911	44	.092
	FD	.118	43	.146	.961	43	.152

Kolmogorov-Smirnov test for understanding the concept of a linear function based on FD and FI learning styles each having a significance value of 0.094 and 0.146, while the Shapiro-Wilk test through the level of significance for understanding the concept of a linear function based on FD and FI learning styles respective each has a significance value of 0.092 and 0.152.

The results of the test significance level greater than 0.05, it can be said that score data the ability of understanding concept of linear functions based on learning styles distributed normally.

Table 11. Homogeneity of Variance Test Scores of Understanding Concept Based on Learning styles

		Levene Statistic	Sig.
UNDERSTANDING CONCEPT	Based on Mean	.001	.982
	Based on Median	.015	.904
	Based on Median and with adjusted df	.015	.904
	Based on trimmed mean	.012	.914

From the results of the calculations in Table 11 above, it appears that for the understanding of the concept of a linear function based on the average (mean) level of significance is 0.982 which means greater than 0.05.

6.6. Hypothesis Testing

Hypothesis testing was conducted in order to test statistically, as well as to determine whether the hypothesis proposed in this study is accepted or rejected.

In this research, hypothesis testing is done by using Manova, where the results of the calculation is divided into two parts, namely (1) the results of calculations that states whether there is a significant difference between the dependent variable, and (2) the results of calculations to test the interaction of each variable.

All the results of these calculations are presented in Table 12,

Table 12. The Calculation Results of Learning Strategies Effect and Learning Styles

Multivariate Tests[b]						
Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.969	1272.577[a]	2.000	82.000	.000
	Wilks' Lambda	.031	1272.577[a]	2.000	82.000	.000

	Hotelling's Trace	31.038	1272.577[a]	2.000	82.000	.000
	Roy's Largest Root	31.038	1272.577[a]	2.000	82.000	.000
SP	Pillai's Trace	.165	8.122[a]	2.000	82.000	.001
	Wilks' Lambda	.835	8.122[a]	2.000	82.000	.001
	Hotelling's Trace	.198	8.122[a]	2.000	82.000	.001
	Roy's Largest Root	.198	8.122[a]	2.000	82.000	.001
GB	Pillai's Trace	.544	48.972[a]	2.000	82.000	.000
	Wilks' Lambda	.456	48.972[a]	2.000	82.000	.000
	Hotelling's Trace	1.194	48.972[a]	2.000	82.000	.000
	Roy's Largest Root	1.194	48.972[a]	2.000	82.000	.000
SP * GB	Pillai's Trace	.038	1.638[a]	2.000	82.000	.001
	Wilks' Lambda	.962	1.638[a]	2.000	82.000	.001
	Hotelling's Trace	.040	1.638[a]	2.000	82.000	.001
	Roy's Largest Root	.040	1.638[a]	2.000	82.000	.001
a. Exact statistic						
b. Design: Intercept + SP + GB + SP * GB						

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

The conclusion of this research are,

1. There is a significant difference to the ability of understanding mathematical concepts between classes with individual learning blended strategies and classroom learning with blended learning strategy in group.
2. There are significant differences in the ability of understanding mathematical concepts among students who have learning FI and FD learning styles.
3. There is interaction between individual and group blended learning strategies, learning styles on the ability of understanding mathematical concepts.

7.2. Recommendation

1. For lecturers of Economic Mathematics subjects in STIE Ekuitas, should be able to consider an alternative method using blended learning strategies as a group of teaching and learning, in order to enhance the students' ability in understanding the concept and application of mathematical procedures other material.
2. Before doing the learning, it it would be better the lecturers use a student's learning style as a consideration to perform learning.
3. Research conducted only limited to the material and application of Linear Functions in economics, it is suggested that research conducted on other mathematical material relating to the economy through blended learning instructional strategies.

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